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(54) MOULDING SLOW SETTING MATERIAL  
(75) ALBERT FRADIN AND CARMELLA RUTH FRADIN  
(21) 63877/80 532845 (22) 20.11.79  
(23) 30.10.80 (24) 20.11.79  
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(56) 32667/78 520956 B29G; C04B  
64504/65 411190 70.1, 80.9  
22169/67 428293 79.4, 70.1, 80.9

(57) Claim

1. A method of moulding an article from a charge of slow-setting material comprising the steps of at least partly encapsulating the charge in an at most partly formed thermoplastic envelope, finish forming the envelope and the charge within it in a die-set while at least that part of the envelope involved in the finish forming is sufficiently warm as to be mouldable, allowing or causing the warm part of the envelope to cool until the envelope as a whole is sufficiently stiff to sustain its own shape and that of the charge within it, then removing the finished formed envelope and charge from the die-set and subsequently allowing said charge of slow-setting material to set.

REGULATION 9

532845

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1979

APPLICATION FOR A STANDARD PATENT

63877/80

APPLICATION ACCEPTED AND AMENDED  
6/9/83  
ALLOWEDWe, ALBERT FRADIN and CARMELLA RUTH FRADIN,

COMPLETE AFTER PROVISIONAL SPECIFICATION No. 63877/80

of Lot 10 Koala Way, Horsley Park, New South Wales,  
Australia,hereby apply for the grant of a Standard Patent for an  
invention entitled:-"MOULDING ARTICLES FROM SLOW-SETTING MATERIALS"Which is described in the accompanying Provisional  
Specification.Our address for service is:- SHELSTON WATERS,  
55 Clarence Street,  
SYDNEY. N.S.W. 2000

DATED This 20th day of NOVEMBER, 1979.

ALBERT FRADIN and CARMELLA RUTH FRADIN

by *Robert G. Shelston.*Fellow Institute of Patent Attorneys of Australia  
of SHELSTON WATERSTo: The Commissioner of Patents,  
WODEN. A.C.T. 2606

File: D. B. 18 (P) gf

Fee: \$10.00

RECEIVED	
Date	20/11/79
Receipt	PE 1412
Application	✓
Declaration	✓
Specification	7+TC
Drawings	

COMMONWEALTH OF AUSTRALIA

PATENTS ACT, 1952-1969

DECLARATION IN SUPPORT OF AN  
APPLICATION FOR A PATENT

63877/80

FEE STAMPS

(a) Here insert (in full) Name of Applicant(s).

In support of the Application made by (a)  
ALBERT FRADIN and CARMELLA RUTH FRADIN

for a patent for an invention entitled:

(b) Here insert Title of Invention.

(b) "MOULDING ARTICLES FROM SLOW-SETTING MATERIALS"

~~I~~/We, (a) ALBERT FRADIN and CARMELLA RUTH FRADIN

(c) Here insert (in full) Address(es).

of (c) Lot 10 Koala Way,  
HORSLEY PARK, NEW SOUTH WALES, AUSTRALIA.

do solemnly and sincerely declare as follows:

1. ~~I~~/We are the Applicant(s) for the Patent.

2. ~~I~~/We are the actual Inventor(s) of the invention (~~or, where a person other than the Inventor is the Applicant).~~

2. (d)

(d) Here insert full Name(s) and Address(es) of Actual Inventor(s) if other than Applicant(s).

..... is/are  
the actual Inventor(s) of the invention and the facts upon which I am/we are entitled  
to make the Application are as follows:

~~I am/We are the Assignee(s) of the said Inventor(s).~~

DECLARED at Horsley Park

this 16th day of November 1979.

(e) Signature(s) of Applicant(s).

(e) Carmella Ruth Fradin  
Albert Fradin

T THE COMMISSIONER OF PATENTS.

SHELSTON WATERS  
PATENT ATTORNEYS  
55-163 CLARENCE STREET, SYDNEY  
AUSTRALIA

532845

FORM 10

COMMONWEALTH OF AUSTRALIA  
PATENTS ACT 1982-89

# COMPLETE SPECIFICATION

FOR OFFICE USE:

Class

Int. Class

Application Number:  
Lodged:

63877/80

This document contains the  
amendments made under  
Section 47.

Complete Specification Lodged:  
Accepted:  
Published:

and is correct for printing.

1 1

Priority:

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30 OCT 1980

Sydney

Related Art:

Name of Applicant:

ALBERT FRADIN and CARMELLA RUTH FRADIN

Address of Applicant:

Lot 10, Koala Way, Horsley Park, New South Wales.

Actual Inventor:

ALBERT FRADIN and CARMELLA RUTH FRADIN

55

Address for Service: Shelston Waters, 288 Clarence Street, Sydney

Complete Specification for the Invention entitled: "MOULDING ARTICLES FROM SLOW-SETTING MATERIALS"

The following statement is a full description of this invention, including the best method of performing it known to me/us:—

Completed of PE 1412 dated  
20th November, 1979.

This invention relates to the moulding of articles from slow-setting materials.

There are many mouldable materials which have a relatively long setting time, for example synthetic resins of the kind comprising two components which are mixed and which thereafter harden due to chemical reaction between the components. It is not unusual for the hardening time for such resins to be from a minimum of about 20 minutes to many hours, depending on the nature of the resin, the temperature of its surroundings and the humidity of the atmosphere. Cementitious materials in which hardening occurs as a result of crystallisation and hydration can take even longer to harden after their components have been mixed than do resinous materials. Likewise, some edible confectionery materials based on chocolate and sugar have a hardening time which is long compared with, for example, thermo-setting materials which harden almost immediately upon being heated in an appropriate die.

All mouldable materials which have such an extended setting time are embraced by the term "slow-setting materials" as used herein. However the present invention relates more particularly though not exclusively, to moulding articles from slow-setting resinous material filled with compatible reinforcing compositions or strands. Typical of such materials is so-called fibreglass, which comprises a resinous slow-setting material reinforced with glass fibre either chopped, or in rovings, or in woven or non-woven mats.

With the moulding of all slow-setting materials by conventional or prior known techniques, the major problem has

been the length of time it is necessary to leave the material in the mould to enable it to harden sufficiently to be self-supporting when taken from the mould. This means that to achieve high production rates a large number of moulds have been required because each mould has a very slow throughput.

10 Therefore, notwithstanding the seeming advantages which would flow from die-casting, that is mould-forming such articles under pressure between male and female dies, namely the production of a precisely shaped, smooth finished and possibly densified article, such a technique has not been used extensively because of the excessive capital cost of the die or dies. On the contrary it has been usual to lay-up fibreglass articles on so-called moulds which are little more than inexpensive formers so that one surface of the article namely that contacting the former is smooth but the other surface is quite rough.

20 Conventionally the former surface is first waxed or otherwise coated with a release layer and then layer upon layer of a reinforcing material is applied to the former and impregnated with the resin. Each layer is worked in by hand tools with the operator systematically working until the desired thickness is achieved. This is of course a time-consuming and laborious operation and whilst from the cost viewpoint, more satisfactory than conventional die-casting would be, it has nevertheless restricted the utilisation of fibreglass and similar materials.

With the foregoing in mind an object of the present invention is to provide a method and apparatus for the



die-casting of fibre reinforced resinous materials and other slow-setting materials.

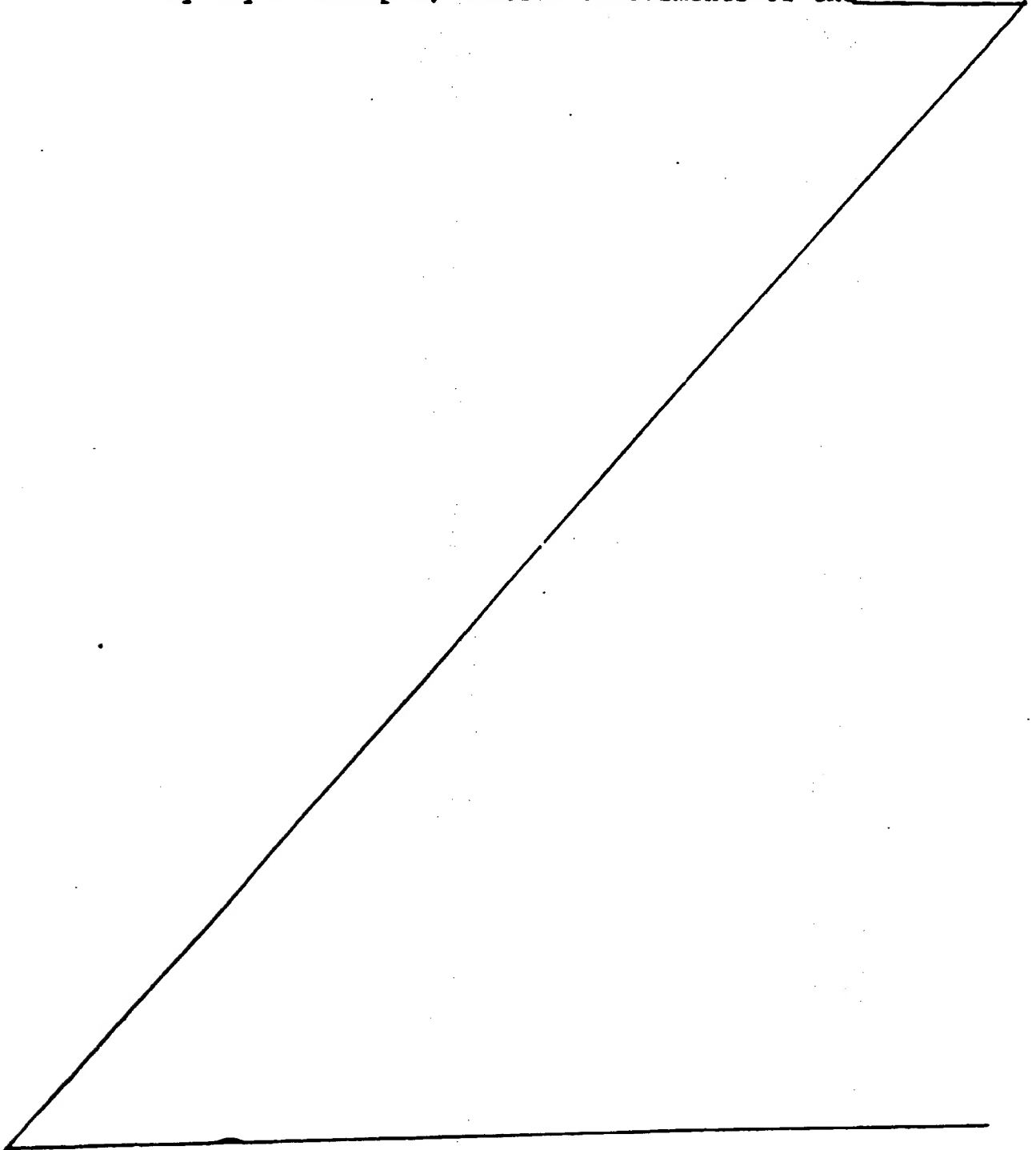
That object is achieved primarily by encapsulating or covering the charge of material to be moulded in an envelope of an inexpensive thermo-plastic material, for example, polyvinyl chloride. The envelope or its component parts may be substantially preformed to adapt those parts to line a die cavity. For preference however, the envelope is either unformed or only partly formed and is itself shaped at the time of die-casting by the operation of the dies. In the latter instance the dies are heated so as to soften the thermo-plastic material and allow it to conform to the shape of the die cavity. Subsequently the die is allowed to cool, or may be artificially cooled, until the thermo-plastic envelope is sufficiently rigid to enable it and the as yet unset, slow-setting material encapsulated in it to be put aside to allow the slow-setting material to set, this quite rapidly freeing the die for the manufacture of a further article.

20 The invention consists in a method of moulding an article from a charge of slow-setting material comprising the steps of at least partly encapsulating the charge in an at most partly formed thermo-plastic envelope, finish forming the envelope and the charge within it in a die-set while at least that part of the envelope involved in the finish forming is sufficiently warm as to be mouldable, allowing or causing the warm part of the envelope to cool until the envelope as a whole is sufficiently stiff to sustain its own shape and



that of the charge within it, then removing the finished  
formed envelope and charge from the die-set and subsequently  
allowing said charge of slow-setting material to set.

By way of example, several embodiments of the



above-described invention are described in more detail hereinafter with reference to the accompanying drawings.

Figure 1 is a diagrammatic cross-sectional view of a three-piece die set and work material at the commencement of a moulding operation.

Figure 2 is a view of the die-set of Figure 1 at a later stage in the moulding operation.

Figure 3 is a similar view of the die-set of Figure 1 at the end of the operation.

10 Figure 4 is a sectional view of a dish-shaped article as formed by the die-set of Figure 1 in an encapsulating envelope.

Figure 5 is a view similar to Figure 4 of the article with the envelope stripped from it.

Figure 6 is a view similar to Figure 1 of a two-piece die-set at an early stage in a moulding operation.

Figure 7 is a view similar to Figure 6 of the die-set of that figure at the end of the moulding operation.

20 Figure 8 is a view similar to Figure 6 of a three-part die-set at the start of a further moulding operation on an article taken from the Figure 6 die-set.

Figure 9 is a view similar to Figure 8 of the die-set of Figure 8 at the end of a mould-forming operation.

Figure 10 is a view similar to Figure 4 of an encapsulated article produced by the Figure 8 die-set.

Figure 11 is a view similar to Figure 5 of the Figure 10 article.

The illustrated embodiments of the invention show the manufacture of simple dish-shaped articles. However it will

be appreciated that the invention is applicable quite generally to all articles of which the shape may be conveniently formed by the co-operating dies of a die-set and the articles illustrated in the drawings have been chosen purely because they will illustrate the principles involved while at the same time constituting simply and readily comprehended examples of the invention.

Referring now to Figures 1 to 5 and initially to Figure 1, a three-part die-set is illustrated comprising a recessed female die 12, an annular male die 13 and a cylindrical male die 14.

At the outset a work stock comprising two thermo-plastic sheets 15 and 16 respectively and a layer 17 of unset resinous material in admixture with a fibrous reinforcement sandwiched between the sheets 15 and 16. Whereas the material of layer 17 at this stage has not set it is nevertheless a fairly viscous liquid and there is little difficulty in achieving a reasonable thickness of layer 17 without substantial leakage.

The dies are heated and the first step in the forming operation is for the dies 13 and 14 to move as one to the position shown in Figure 2. It will be seen that a fairly sharply pointed circular rib 18 on the end face of the die 13 deforms the sheet 15 into contact with the sheet 16 and thereafter heat-seals the two sheets together. Thus as can be seen in Figure 2 a fully encapsulated substantially planar partly formed workpiece 19 is created within the die cavity.

Thereafter die 14 moves to the position shown in Figure 3 and in so doing finish forms both the envelope and the

charge of still unset material 17 within it. The supply of the die heating medium is then discontinued and if desired replaced by a supply of cooling medium to more rapidly cool the dies. Even if no cooling medium is used, if the die heat is such as only to soften the thermo-plastic sufficiently to accommodate the forming action, it is not long before the thermo-plastic envelope encapsulating the charge of material 17 is sufficiently rigid to enable the die to be opened and for the article shown in Figure 4 to be removed therefrom. That article is then put aside to allow the material 17 to set.

Thereafter, if desired the envelope comprising the portions of sheets 15 and 16 shown in Figure 4 may be removed to leave the finished article shown in Figure 5 or alternatively if the thermo-plastic outer layers are not objectionable or maybe even desirable in the finished article, they may be left in place.

Figures 6 and 7 illustrate dies very similar to those of Figures 1 to 3 and comprise a female die 19 and co-acting male die 20.

In this embodiment of the invention instead of the components of the thermo-plastic envelope being initially substantially planar, they are formed by way of a pre-forming process into shaped components 21 and 22 respectively adapted neatly to clad the operative surfaces of the dies 19 and 20 which define the mould cavity.

In this instance the thermo-plastic components do not substantially enclose the resinous material and its fibrous reinforcement. Instead an appropriate quantity of the

resinous material 23 may be deposited within the well of component 22 and a layer of fibrous reinforcing material 24 may be more or less loosely laid across the mouth of that well. During the early part of the closing stroke of the dies the male die advances the layer 24 into the charge of resinous material 23 and as the dies close the material 23 is caused to flow through the reinforcing material 24 to impregnate it and with it fill the final mould cavity. This is shown in Figure 7 and it will be seen that the heated male die at the time of closing the cavity also seals the line of contact between component 21 and component 22.

If an article of the shape of the cavity of Figure 7 is required then the article filling that cavity in Figure 7 may be allowed to cool and removed therefrom and set aside as before.

However it may be that further shaping of the article is called for and if so it may be transferred to a further set of dies to effect such shaping.

For example, Figures 8 and 9 illustrate a die-set adapted to form a deeper well in the floor of the article released from the dies of Figures 6 and 7. To that end the dies of Figures 8 and 9 comprise a three-part die-set namely a female die 25, an annular male die 26 and a cylindrical male die 27.

When the article from the die-set of Figures 6 and 7 is placed within the female die 25 it appears as shown in Figure 8. Subsequently die 26 may advance to bring its profiled surface into contact with the partly formed article and thereafter heated die 27 may be advanced to soften the

thermo-plastic nvelope and to further shape th floor of the  
articl as illustrated in Figure 9.

Once again th article may be allow d to cool and if  
d sired stripped of th th rmoplastic covering as indicat d  
in Figures 10 and 11 respectively.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A method of moulding an article from a charge of slow-setting material comprising the steps of at least partly encapsulating the charge in an at most partly formed thermoplastic envelope, finish forming the envelope and the charge within it in a die-set while at least that part of the envelope involved in the finish forming is sufficiently warm as to be mouldable, allowing or causing the warm part of the envelope to cool until the envelope as a whole is sufficiently stiff to sustain its own shape and that of the charge within it, then removing the finished formed envelope and charge from the die-set and subsequently allowing said charge of slow-setting material to set.

2. A method according to Claim 1 wherein the finish forming comprises the heat-sealing together of a plurality of substantially fully preformed envelope components.

3. A method according to Claim 2 wherein the charge of slow-setting material is initially held in one of the envelope components and the finish forming is effected by bringing these components together to define an interior shape corresponding to that of the finished article.

4. A method according to any one of the preceding claims wherein the slow-setting material comprises a resinous material filled with fibrous reinforcing material.

5. A method of moulding an article from a charge of slow-setting material substantially as described herein with reference to Figures 1 to 5, or Figures 6 and 7, or Figures 8 to 11 of the accompanying drawings.



6. A method according to any one of the preceding claims comprising the further step of removing said envelope from the set charge of slow-setting material.

7. A moulded article when made by a method in accordance with any one of the preceding claims.

DATED this 29th day of August, 1983.

ALBERT FRADIN AND CARMELLA RUTH FRADIN.

Attorney: ROBERT G. SHELSTON  
Fellow Institute of Patent Attorneys of Australia  
of SHELSTON WATERS



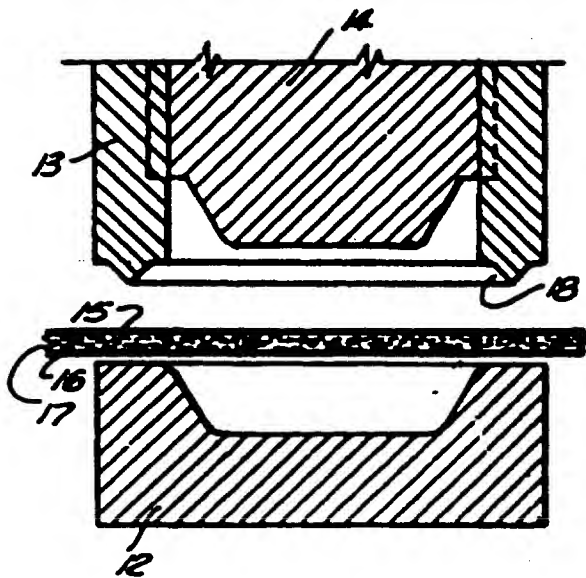


FIG. 1

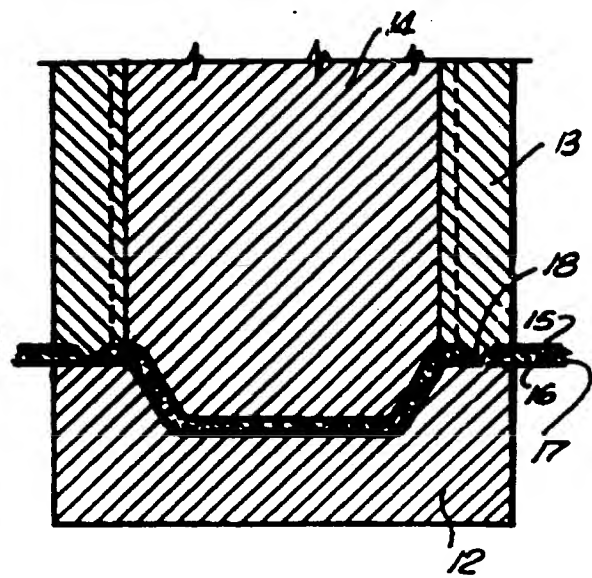


FIG. 3

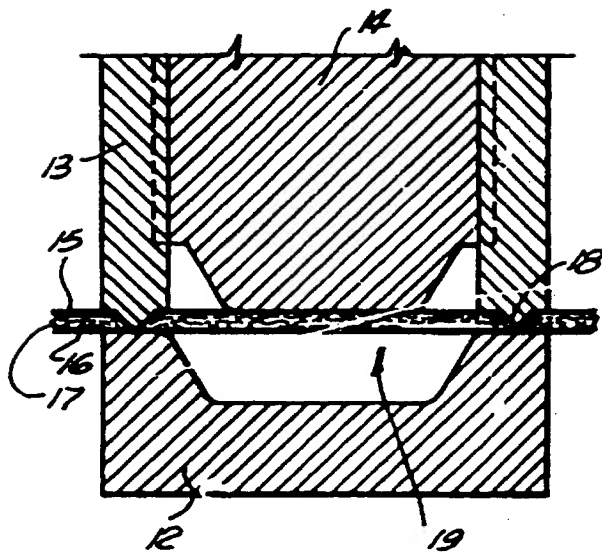


FIG. 2

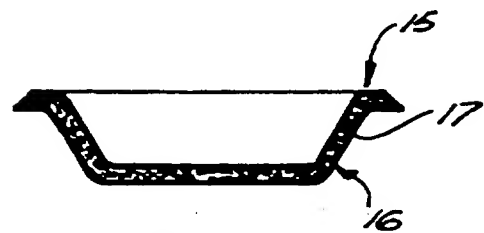


FIG. 4

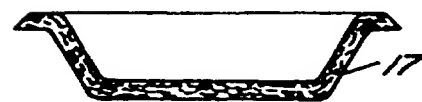
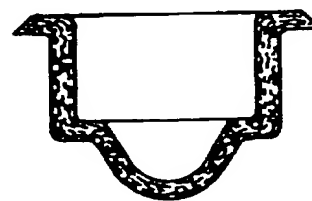
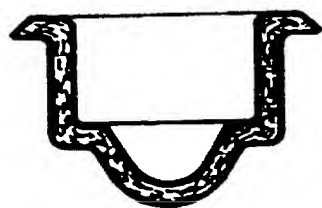
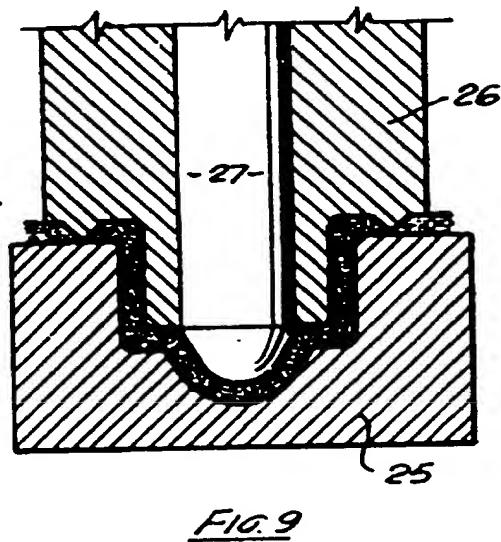
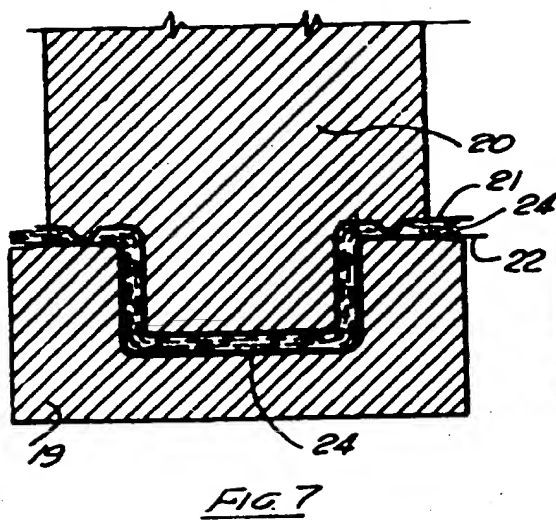
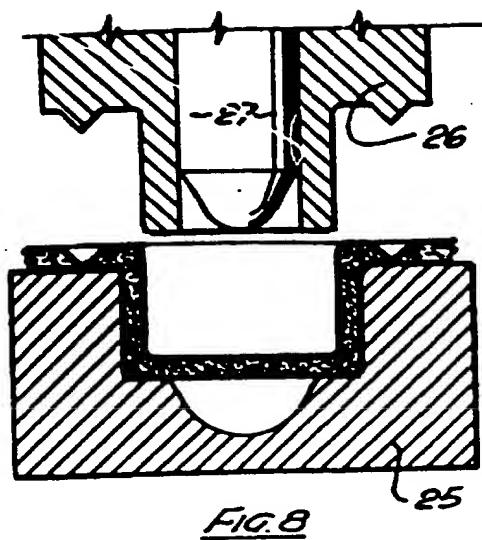
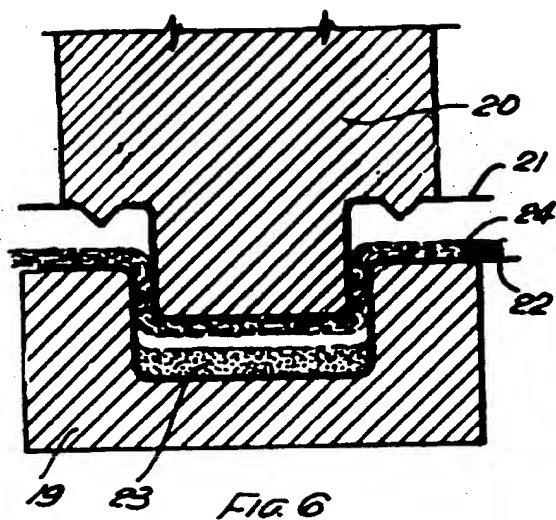


FIG. 5



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